Examiners' report on Paper A (Electricity/Mechanics)

1. General considerations

The client develops electrical measurement or test devices, in particular electrical devices to be installed in a so-called confined environment into which energy cannot be transported in an electrical form.

A known solution is to convey the energy needed for powering the electrical device in an optical form. The optical energy, generated for instance by a laser, is then converted in the confined area into electrical energy that is needed by the measurement or test device. This is commonly achieved by the use of a photovoltaic cell or a plurality of photovoltaic cells interconnected in series.

A problem resides in the fact that the voltage generated in such a way is a DC voltage, which needs to be converted into an AC voltage in order to power most electrical devices developed by the client.

The client clearly excludes a solution based on the use of a DC to AC converter, which has drawbacks, as elaborated in the client's letter on page 1, third paragraph. The aim is to provide a system converting optical energy directly into electrical energy in the form of an AC voltage, i.e. without going through the step of generating first a DC voltage and then converting it into an AC voltage.

Prior art document D1 discloses such a system. It uses a pivoting mirror alternately reflecting an incoming light beam towards two photovoltaic cells. The cells are connected in such a way that an AC voltage is generated between their output terminals. For pivoting the mirror, a motor is used which is powered by a separate battery.

In one of the systems described by the client, the alternating or reciprocating movement is achieved by an optical fibre conveying the input light beam. In other embodiments, prisms for redirecting the light beam or the photovoltaic cells themselves are moved. In all these embodiments the alternating or reciprocating movement is generated through energy generated by the system itself. There is no need, in contrast to the prior art document D1, for any source of energy additionally to the input light beam.

Good candidates directed their answer to such a solution thus fully complying with the client's wishes by embracing all the embodiments described in the client's letter.

2. Independent claim(s)

2.1 Preferred solution

Good solutions should, therefore, have clearly set out that the reciprocating or oscillating movement in the claimed system is achieved by using energy generated by at least one of the photovoltaic cells.

A good independent claim could have been directed to an apparatus for converting an optical energy input into an AC electrical output and could have included the following features:

- first and second energy conversion means (26, 28) operable to convert input optical energy into a respective voltage output;
- the energy conversion means (26, 28) being interconnected to an electrical output;
- directing means (34-38, 40) operable to cause the input optical energy to be directed alternately to the first and second energy conversion means (26, 28) so as to produce an AC output at the electrical output; and
- the directing means (34-38, 40) being operable to be powered by the voltage output from at least one of the energy conversion means (26, 28).

The above list illustrates a combination of features that could have been included in an independent apparatus claim notwithstanding that the features could have been expressed using different wording.

For example, the apparatus could have been referred to as “a converting system”, “an energy converter”, “a power converter”, “an AC voltage supply”, “a generator of AC voltage out of light”, … as long as it was clear that the apparatus is suitable for generating an AC electrical output.

Two, or at least two, conversion means needed to be claimed. If only one conversion means was defined, only a pulsed DC voltage can be generated.

As indicated above, a good independent claim should have embraced all three embodiments described by the client, namely where

- the optical fibre is moved / reciprocated,
- the redirecting means (prisms, mirrors) are moved / reciprocated,
- the conversion means are moved / reciprocated.

Solutions clearly excluding one or more of the embodiments were penalised.

An additional method claim corresponding to the preferred apparatus claim was not expected and was therefore not rewarded.

A claim to the use of the previously claimed apparatus in a confined area could have received a small reward if it was clear what was meant by a confined area in the context of the present invention (e.g. “area into which it is not possible to transport electrical energy”).

2.2 Novelty and Inventive Step

Lack of novelty has always been considered to be a serious deficiency and could ha caused the loss of more than half of the marks available for the independent claim. Some candidates drafted claims lacking novelty, because they had overlooked important information in the prior art. For example, D1 discloses an embodiment with an optical fibre (cf. page 1, last paragraph). As another example, although it only has a single photovoltaic cell, D2 discloses a converter of optical energy into electrical energy in the form of a system for generating a pulsed DC voltage.

Candidates are reminded that an independent claim should also involve an inventive step in order to have a good chance of succeeding before the EPO, as required by the instructions to candidates.

2.3 Unnecessary limitations

Marks were lost for unduly restricting the independent claim. An unnecessary restriction often seen was a claim that defines an apparatus only when in use, thereby not explicitly covering the apparatus in a non-active state. Another example of an unnecessary restriction was a claim limited to a test or measurement device. As already stated earlier, it was important not to exclude any of the three embodiments mentioned above.

Further unnecessary limitations related to the inclusion of means for providing optical energy (laser or any means for generating light**,** optical fibre), of one or two electromagnetic coils and/or one or two ferrous elements, of redirecting means such as prisms or mirrors, or of a transformer or an electrical device connected to the outputs of the conversion means.

A less severe unnecessary limitation was considered to include the powering of the directing means by both conversion means thus excluding an embodiment having a single coil and a spring as could be derived from D2.

2.4 Clarity

Lack of clarity was penalised according to its seriousness. Candidates were expected to draft their claims in terms of positive technical features and avoid a negative definition of the invention, such as a disclaimer of the kind “without a separate source of energy”. A claim having such a disclaimer as the sole characterising “feature” was heavily penalised.

2.5 Formal matters

Formal deficiencies, such as a lack of two-part form (the use of which was clearly appropriate in the present case), a clearly incorrect two-part form or no reference signs resulted in a small deduction.

2.6 Separate applications

No marks were available this year for the indication of the subject-matter of a claim with potential for a separate application.

3. Dependent claims

In a good set of dependent claims, the following groups of features were expected to be developed:

Features relating to the light path:

wave guide / optical fibre

pivot point / movable in a plane

redirecting means

prisms / mirrors

source of optical energy / laser

Features relating to the alternating movement:

movable components of the light path

fibre

redirecting means

conversion means

at least one coil / two coils

magnetic material / ferrous ring or sleeve

offset rest position

Other features:

test or measurement device

transformer

However, to achieve good marks candidates needed to have progressively developed an appropriate number of claims, thus arriving at a logically structured set of dependent claims which could provide useful fallback positions.

Candidates who made inappropriate combinations of features within a dependent claim ran the risk of not receiving full credit for those features, particularly where this resulted in an unnecessarily limited fallback position.

Description

Candidates were expected to properly acknowledge the parts of the closest prior art that are relevant to the application to be prepared. This should be consistent with the preamble of the candidate's independent claim(s). A large majority of candidates considered D1 as being the closest prior art for the rather obvious reason of it serving the same general purpose of directly converting optical energy into an AC voltage. Where D2 was used as the starting point the candidate, to receive high marks, had to demonstrate convincingly why and how D2 could be seen as the closest prior art. A discussion of both documents was not considered necessary.

Candidates were also expected to disclose the invention in such terms that the technical problem and its solution could be understood. This normally requires an explanation of how the problem derived from the prior art. Marks were deducted where the statement of problem or the solution was not consistent with the drafted independent claim(s).

In view of the expected solution, the fundamental problem to be solved with respect to D1 was to provide an apparatus for converting an optical energy input into an AC electrical output which obviated the need for a separate source of energy for the re-directing means.

General statements like "the problem is to improve the known apparatus" or "to avoid the disadvantages of the state of the art" received only very few marks, unless they were preceded by a detailed discussion of inconveniences of the closest prior art.

EXAMINATION COMMITTEE I Candidate No. .....

Paper A (Electricity/Mechanics) 2003 - Schedule of marks

Category	Maximum possible	Marks awarded	
		Marker	Marker
Independent claims	50		
Dependent claims	35		
Description	15		
Total	100		

Sub-Committee for Electricity/Mechanics agrees on .....marks and recommends the following grade to the Examination Board:

☐ PASS
(50-100)

☐ FAIL
(0-49)
COMPENSABLE FAIL
(45-49, in case the candidate sits the examination for the first time)

Bruxelles, 27 August 2003

Chairman of Examination Committee I